UPDATE IN PERIOPERATIVE MEDICINE

Noncardiac elective or semi-elective surgery

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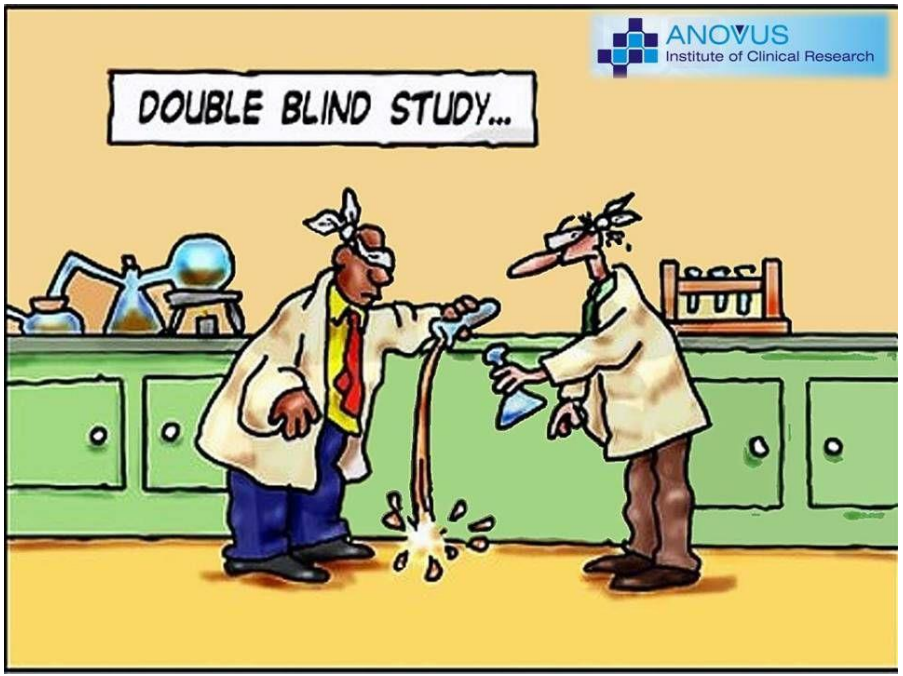
Disclosures

- No conflicts of interest
- Liberally used web-based images
- Great material from CCA/ACC

"Now, I can say that I've officially seen everything"

Key Updates (4 cases)

1. Anticoagulation
2. Cardiac Risk Stratification
3. Hypertension Meds
4. PCI and Stents



Goals of Perioperative Evaluation

Optimize Perioperative Risk

Identify highest risk periop patients

230Million	Surgeries worldwide/year
3 Million	Post-op deaths worldwide
10 Million	Major Adverse Cardiac Events
4%	Surgical death rate @ 7 days (Based on UK data)
53 Million	US ambulatory procedures
10%	- Patients driving most complications
	- Serious complication rate unchanged
	- ERAS (enhanced recovery after surgery) has 33% fewer post-op complications (15K, Kaiser)

Lancet 2012; 380: 1059–65 Anesthesiology 2014;120:564-78 JAMA Surgery, 2017 152(7):e171032

Perioperative anticoagulation

Perioperative anticoagulation: DOAC?

Factor Xa inhibitors

Factor IIa inhibitors

Vitamin K antagonist

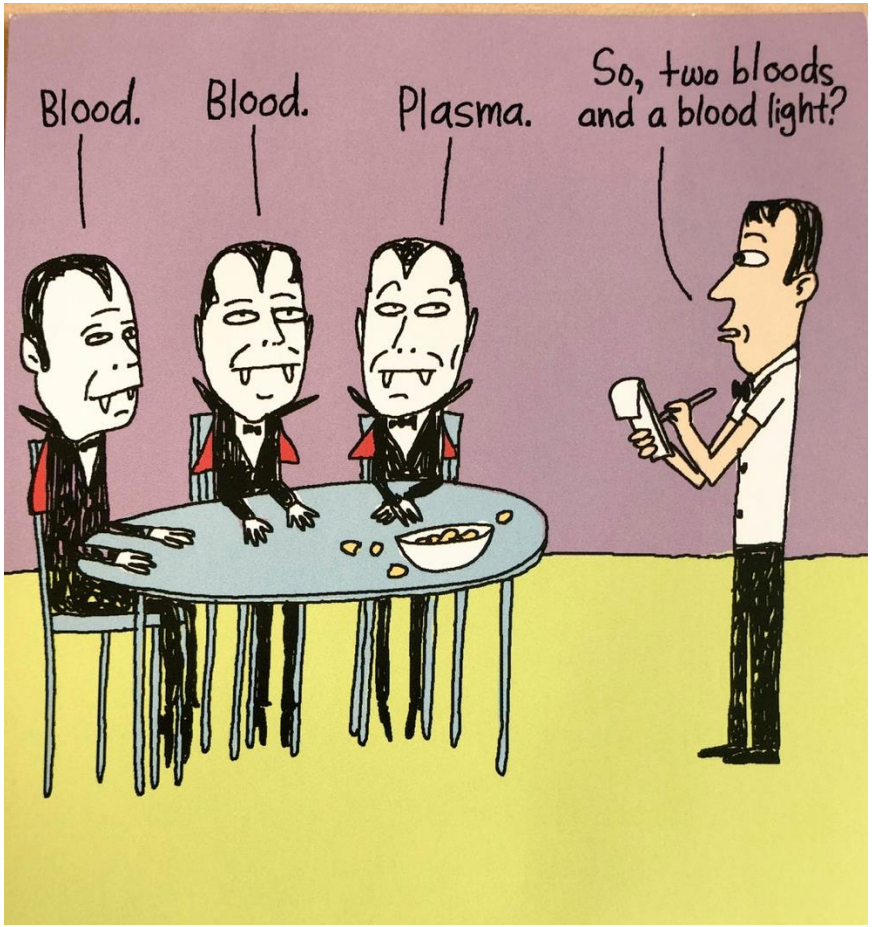
Peri-procedural Major Bleeding Risk

Peri-procedural Thrombotic Risk

Shutterstock

Major Bleeding

- Fatal bleed
- Hb ≥ 2g drop or ≥ 2UPRBC
- Needs surgical correction



Omran, Throm Haemos. 2012 Jul;108(1):65-73.

(David Steensma on twitter, comic source not

Perioperative anticoagulation

88yo woman with afib on Xarelto (no prior strokes) has mild bloody stools. CT shows colonic mass, colonoscopy planned in 1 week. VSS. Periop: What shall we do with her rivaroxaban (Xarelto)?

a. Continue rivaroxiban through colonoscopy
b. Stop rivaroxiban 2 days before; bridge with heparin/lmwh
c. Stop rivaroxiban 2 days before; restart after hemostasis

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HOT OFF THE PRESS

JAMA Internal Medicine | Original Investigation

Perioperative Management of Patients With Atrial Fibrillation Receiving a Direct Oral Anticoagulant

James D. Douketis, MD; Alex C. Spyropoulos, MD; Joanne Duncan, BSc; Marc Carrier, MD, MSc; Grégoire Le Gal, MD; Alfonso J. Tafur, MD; Thomas Vanassche, MD; Peter Verhamme, MD; Sudeep Shivakumar, MD; Peter L. Gross, MD, MSc; Agnes Y. Y. Lee, MD, MSc; Erik Yeo, MD; Susan Solymoss, MD; Jeannine Kassis, MD; Geneviève Le Tremplier, MD; Stephen Kowalski, MD; Mark Blostein, MD; Vinay Shah, MD; Elizabeth MacKay, MD; Cynthia Wu, MD; Nathan P. Clark, PharmD; Shannon M. Bates, MDCM, MSc; Frederick A. Spencer, MD; Eleni Arvaniti-giou, MD, PhD; Michiel Coppens, MD, PhD; Donald M. Arnold, MD, MSc; Joseph A. Caprini, MD; Na Li, PhD; Karen A. Moffat, MLT; Summer Syed, MD, MSc; Sam Schulman, MD, PhD

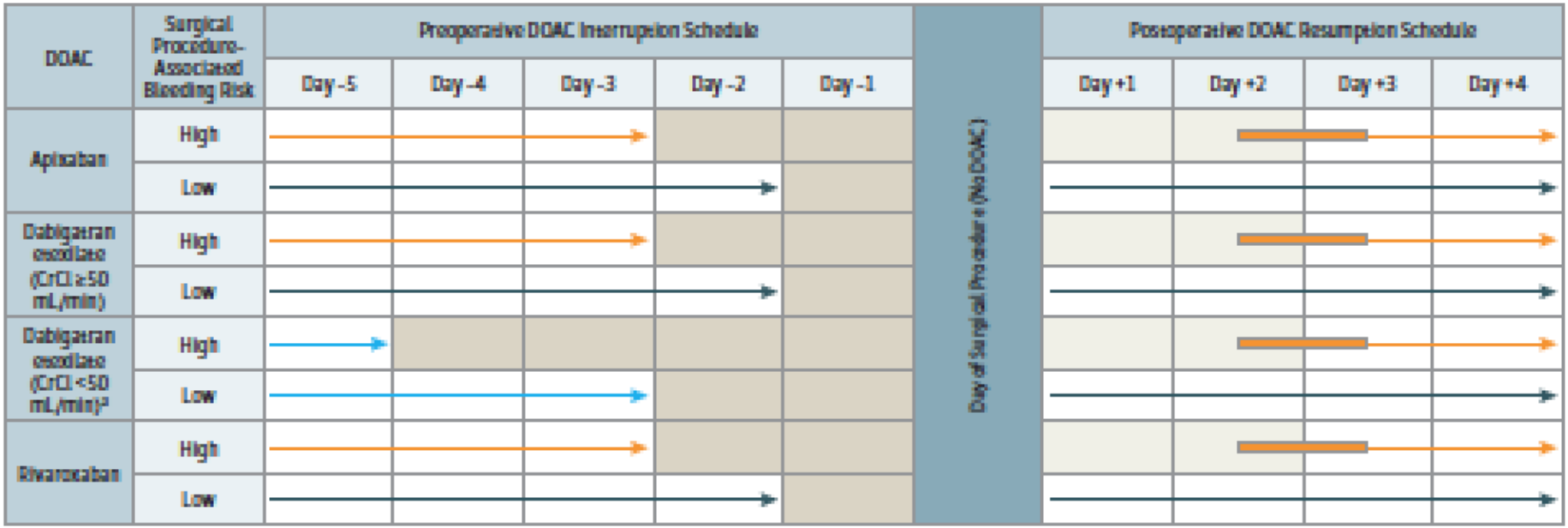
August 2019

- Prospective Clinical Trial of DOAC cessation
- 23 centers, US/Canada/Europe
- n= 3007, mean age72yo,
- procedures: 1000 ↑ bleeding risk, 2000 ↓ risk

PAUSE: elective surgery, nonvalvular afib

- Interruption and resumption strategy: hold NOACS for 1-4 days
- No bridging

Figure. Perioperative Direct Oral Anticoagulant (DOAC) Management Protocol



Duoketis, JAMA Intern Med, August 2019

PAUSE: 30 day outcomes

	Bleeding	CVA/MI
Apixiban	1.4%	0.2%
Rivaroxiban	1.9%	0.6%
Dabigitran	0.5%	0.4%

*Bleeding risks almost doubled with high risk procedures

Duoketis, JAMA Intern Med 2019

PAUSE Study: non-valvular afib

Generally safe to stop NOAC for elective procedures, especially lower risk surgeries.

Duoketis, JAMA Intern Med 2019

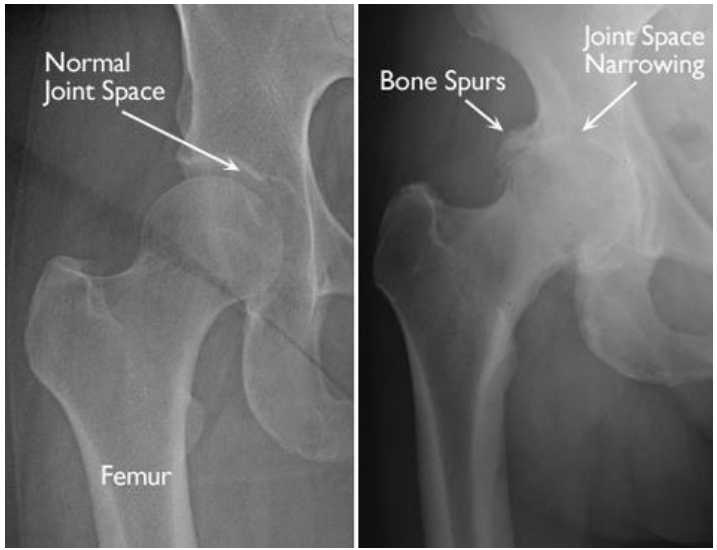
Perioperative cardiac risk assessment (prevent MACE)

Perioperative cardiac risk assessment

78yo woman with CAD, TIA and OA right hip.
Perioperative evaluation for total hip arthroplasty in 2 weeks.
VSS, exam consistent with OA.

What is the patient's perioperative cardiac event risk?

a. <1%
b. 1-5%
c. 5-10%
d. >10%



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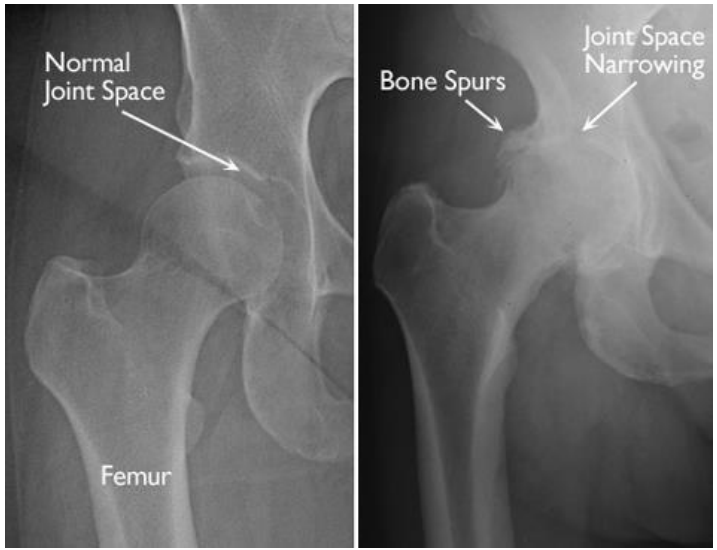

3 most common cardiac risk stratification indices

RCRI

Developed by Goldman 1977

Updated by Lee 1999, then with more data Duceppe 2017

Most studied!

NSQIP

Developed in 2013 with 1.4M patients by Bilimoria, now updated: 4.3M pts

Gupta/MICA

Derived from NSQIP database by Gupta in 2011: with 200K patients

Revised Cardiac Risk Index

RCRI doesn't discriminate well between outcomes in high vs low risk surgical risk

- Sens 65%
- Spec 76%

Ford. Ann Intern Med. 2010 Jan 5;152(1):26-35. (790K pts)

Revised Cardiac Risk Index

Patient has…	Points
CAD	1
CHF	1
CVA	1
DM on Insulin	1
Has CKD (Cr >2)	1
High-risk surgery	1

RCRI score	MI, cardiac arrest, death within 30days	95% CI
0	3.9%	2.8%-5.4%
1	6%	4.9%-7.4%
2	10%	8.1%-12.6%
≥3	15%	11.1%-20.0%

Ford. Ann Intern Med. 2010 Jan 5;152(1):26-35. (790K pts)

Our patient
RCRI = 2

10% MACE event rate at 30 days

For additional risk stratification, order…

a. EKG
b. NT Pro-BNP
c. Echocardiogram
d. Exercise Stress Test
e. CT Coronary Angiogram

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Rodseth, JACC 2014: (63):2, 170-180

The Prognostic Value of Pre-Operative and Post-Operative B-Type Natriuretic Peptides in Patients Undergoing Noncardiac Surgery

B-Type Natriuretic Peptide and N-Terminal Fragment of Pro-B-Type Natriuretic Peptide: A Systematic Review and Individual Patient Data Meta-Analysis

JACC 2014 Meta-analysis

- 2179 patients, 18 studies
- 30d outcomes
  - Cardiac events 10.8% (Troponin > 0.04)
  - Death 3% died

RCRI ≥ 1

NT-proBNP≥

300 = 22% MACE

death or nonfatal MI at 30 days

aOR 3.4 (2.6-4.5)

Rodseth, JACC 2014: (63):2, 170-180

NT-proBNP≥

300 = 22% MACE

death or nonfatal MI at 30 days

If < 300 (or BNP <92) = 4.7% risk

Rodseth, JACC 2014: (63):2, 170-180

Canadian Cardiovascular Society 2017

Order NT-proBNP or BNP if

- RCRI ≥ 1
- Patient > 65yo
- 18-64yo with significant CV dx

Duceppe. Can J Cardiol. 2017, 33(1):17-32. doi: 10.1016/j.cjca.2016.09.008. Epub 2016 Oct 4

Canadian Cardiovascular Society 2017

NT-proBNP≥

300

Then, recommend:

- Troponin daily for 48-72hrs
- EKG in PACU
- Consider ERAS/care team management

Duceppe. Can J Cardiol. 2017 Jan;33(1):17-32. doi: 10.1016/j.cjca.2016.09.008. Epub 2016 Oct 4

Blood Pressure Medications

Blood Pressure Medications

74yo woman with HTN, for evaluation of semi-elective leiomyoma resection with bleeding.

Meds: HCTZ, lisinopril, amlodipine.
You recommend…

a. Start metoprolol morning of surgery
b. Hold lisinopril morning of surgery
c. Hold amlodipine morning of surgery
d. Give HCTZ morning of surgery.

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META-ANALYSIS

A Systematic Review of Outcomes Associated With Withholding or Continuing Angiotensin-Converting Enzyme Inhibitors and Angiotensin Receptor Blockers Before Noncardiac Surgery

Caryl Hollmann, MBChB, DA(SA), Nicole L. Fernandes, MBChB, DA(SA), and Bruce M. Biccard, MBChB, FCA, PhD

Sept 2018: Systematic Review

- 9 studies: 5 RCT, 4 cohort, n= 6022 patients
- Continued (n=1816) vs stopped ACEI/ARB (n=4206)

Hollman. Anesth Analg. 2018 Sep;127(3):678-687

Hold ACEI/ARBs to prevent hypotension

Stop ACE/ARB:	Mortality unchanged	OR 0.97 (0.6 - 1.52)
	MACE unchanged	OR 1.1 (0.8 -1.52)
	Less hypotension	**OR 0.6 (0.5 – 0.85)**

Recommendation

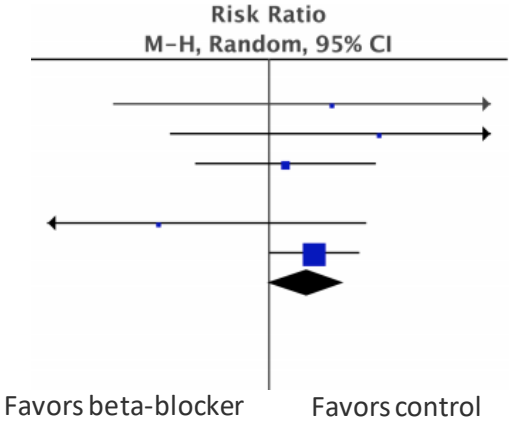
- Generally hold ACE on day of surgery, but individualize
- Hypotension risk worst on POD1 (may restart afterwards)

Hollman. Anesth Analg. 2018 Sep;127(3):678-687

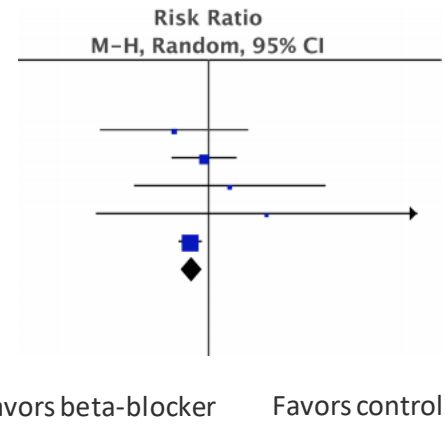
Don’t initiate β-blocker (POISE and Bouri)

- increases stroke (1.0% vs 0.5%)
- Increases all cause mortality (3.1% vs 2.3%)
- decreases MI slightly (4.2% vs 5.7%)

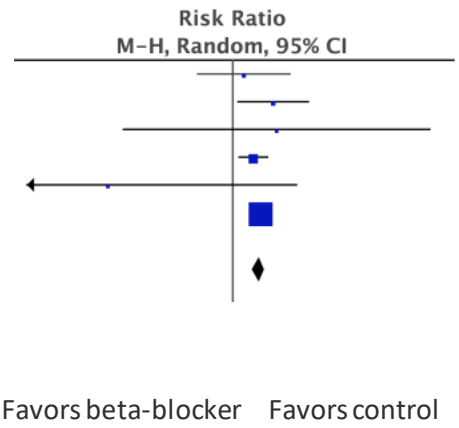
Bouri 2014, systematic review (secure trials only shown)



Nonfatal Stroke
N = 5090



Post-op MI
N = 5093



Hypotension
N = 5146

POISE Study Group. Lancet 2008 (371 (9627) 1839-1847 Bouri S, et al. Heart 2014;100:456–464

If taking a β-blockers, continue, don't withdraw

- Retrospective cohort @ SFVA
- 1996-2008, n=12,105

All cause 30-day mortality

continuation: aOR 0.74 (95% CI, 0.51-1.05)

withdrawal: **aOR 3.57** (95% CI, 2.31-5.52)

1 year mortality

continuation: aOR 0.82 (95% CI, 0.67 to 1.0)

withdrawal: **aOR 1.96** (95% CI, 1.49 to 2.58)

Wallace. Anesthesiology. 2010 Oct;113(4):794-805

PCI and Cardiac Stents

PCI and Cardiac Stents

68yo man with CAD s/p DES 6 months ago presents for perioperative evaluation of elective rotator cuff repair next week. Meds: dual antiplatelet therapy (ASA and Plavix) to prevent in-stent rethrombosis. You recommend:

a. Proceed with surgery
b. Delay surgery for 3 months
c. Delay surgery for 6 months

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c. Delay surgery for 6 months

Waiting after cardiac arterial intervention

New shorter duration from ACC/AHA

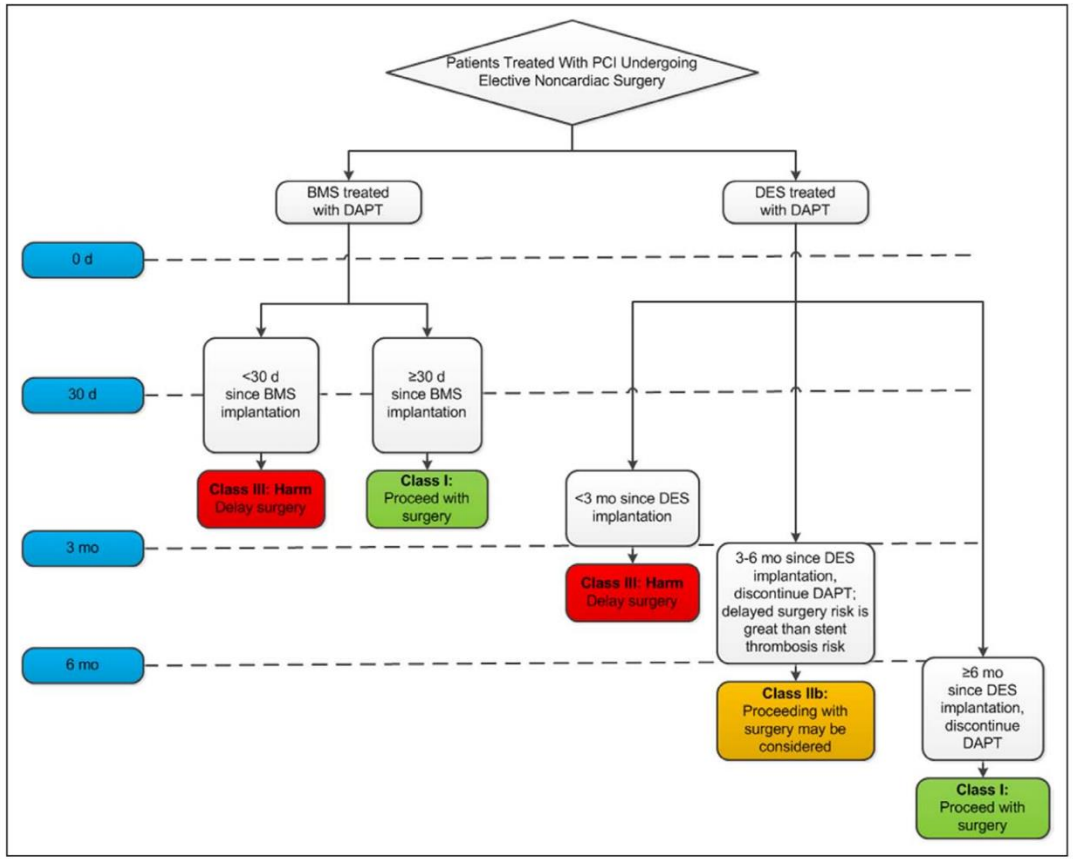
TABLE 1

Minimum duration for surgical delay after percutaneous coronary intervention

Type of coronary intervention	Delay for nonurgent surgery
Angioplasty without stenting	14 days[2]
Bare-metal stent	30 days[16]
Drug-eluting stent	Optimal: 6 months[16] 3–6 months if benefits of surgery outweigh risks of stent thrombosis[16]

From references 2 and 16.

2016 ACC/AHA DAPT recs: PCI and stable ischemic heart disease (SIDH)



Based on:

11 new studies DES + shorter duration DES

1 large RCT patients with MI, one year after ASA or DAPT.

Levine et al, Circulation. 2016;134:e123–e155.

Bottom line

- Wait for at least 6 months for DES if you can – don't want to thrombose the stent
- If you can't wait, ortho can operate on antiplatelet therapy (they don't like it, but they usually can!)
- Neurosurgery or major bleeding may require reversal (with platelet transfusion or ddAVP)


summary

Summary: for elective noncardiac surgeries

1. Generally safe to stop DOACs 1-3 days before surgery
2. If RCRI ≥ 1, get NT-pro-BNP or BNP
3. If NT-proBNP ≥ 300: PACU EKG & troponins x 48-72hrs
4. Hold ACE/ARB day of surgery and POD1
5. Don't stop or newly start beta-blockers before surgery
6. Don't have to wait as long for DAPT for PCI/stents

Thank you!